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POISONOUS SUBSTANCES USED IN COMBAT BY FOREIGN ARMIES, AND CHEMICAL-WARFARE DEFENSE

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Article 479

Chemical substances used in combat are divided into poisonous, smoke-forming, and incendiary substances.

1. Poisonous Substances Used in Combat (OVs /otravlyayushchiye veshchestva/)

These represent poisonous chemical substances which may be used in time of war for the contamination of unprotected people and animals, and for the contamination for a certain time of the locality and its material facilities.

Stable poisonous substances (SOVs /stoykiye otravlyayushchiye veshchestva/) are distinct from unstable poisonous substances (NOVs /nestoykiye otravlyayushchiye veshchestva/). Stable poisonous substances (mustard gas, lewisite) are vaporized slowly; they consequently retain their poisoning action at the contaminated locality from several hours to several weeks.

Unstable poisonous substances (OVs) (chlorine, phosgene) are rapidly vaporized, and are quickly dispersed in the air. The duration of their action is ordinarily measured in minutes.

The combat stability of OVs can be changed, depending on the weather, the locality, and other conditions. For example, in deep natural features through which the wind does not blow (shell craters, pits, etc), unstable OVs are retained rather long. In summer, in the presence of high temperature, drops of stable OVs are vaporized much more rapidly than in the cold time of the year.

In the presence of interaction with moisture (for example, from the moisture of the soil, atmospheric precipitation), many OVs undergo changes which will be spoken of in more detail in Part II.

Article 480

Characteristic Peculiarities of Poisonous Substances Used in Combat (BOVs /boyevyye otravlyayushchiye veshchestva/)

In contrast to artillery shells and bullets which fly in a definite direction, OVs, when admixed to the air and moved along the direction of the wind, occasion a massivity of the contamination produced by them, penetrating into all kinds of slit trenches, covered positions, and depressions of the locality (and also into trenches) inaccessible to firing. For certain OVs (e.g., mustard gas) the length of action is also characteristic. The air, soil, clothing, and items of equipment are readily contaminated with OVs and can become a source of subsequent poisonings of humans and animals.

Routes of influence of OVs on the organism are the same as those routes, already known to us, through which infection takes root. These

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are: (a) the respiratory tracts through which OVs combine with the air being respired; (b) the integuments of the body (the skin and mucous membranes); (c) the eyes; (d) the gastrointestinal tract when food and water contaminated with OVs are used; (e) finally, through open wounds and wounds caused by gas /chemical/ shells, OVs can get into the blood stream and evoke phenomena of general poisoning of the organism.

With regard to concentration and exposure: by concentrations of OVs, its quantity in a unit volume of air is understood. It can be expressed in mg/lit of air or -- which is quantitatively the same thing -- in g/m^3 of air. Example: 0.4 mg/lit, or 0.4 g/m^3 of air. The time of influence of OVs on the organism, expressed in minutes, is called the exposure.

The action of the given OVs on the organism depends not only on (1) the chemical composition of the given agent, but also on (2) the concentration of the OVs in the contaminated air or on the quantity of OVs on the skin, (3) on the length of presence in the contaminated atmosphere, i.e., on the exposure, (4) on the corresponding behavior of the person, i.e., whether he is still or moves, whether he conducts physical work or not, etc, and (5) on the peculiarities and state of the organism itself (on the sex, age, whether the person is strong or is suffering, for example, from any disease of the lungs, etc).

The methods of application of BOVs are diverse: (1) they are introduced into the air which the enemy must breathe; or (2) they are placed on the ground along which he must move and simultaneously on objects which he must use; and sometimes (3) people are attacked directly, being poured over with OVs from the air.

Used for combat purposes are gaseous, liquid, and solid OVs which are preliminarily placed in special jackets (aviation and terrestrial devices, shells, mines, bombs, etc). At the moment of being freed from their jackets (e.g., in the presence of the explosion of shells or when poured out from the device, etc), OVs either (1) pass into the vapor state; or (2) into the form of very fine liquid particles which are admixed with the air, forming a fog (i.e., a suspension in the air of very fine droplets); or (3) form a suspension of very fine solid particles in the air (smoke); or (4) pass into the liquid-drop state, i.e., are poured like rain and form little puddles on the surface of the ground. Sometimes OVs simultaneously act in different states: e.g., in the explosion of a shell filled with mustard gas, the latter is converted into a vapor and fog and also trickles down at the site of the burst in the form of a liquid which subsequently is also vaporized, poisoning the atmosphere.

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On the basis of their action on the human organism, the BOVs known up to the present time are divided into 5 groups: (1) of a suffocating action (chlorine, chloropicrin, diphosgene); they primarily influence the respiratory organs; (2) of a general poisonous action (hydrogen cyanide, carbon monoxide): they evoke the phenomena of a general poisoning of the organism; (3) of a blistering action (mustard gas and lewisite), which are distinguished from other OVs by the fact that they evoke blisters on the skin; (4) of a lachrymatory /tear-gas/ action (e.g., chloroacetophenone): even in insignificant quantities, they act primarily on the mucous membrane of the eyes, evoking lachrymation; (5) of an irritating action (for example, adamsite): they yield even in insignificant quantities phenomena of acute irritation of the upper respiratory tracts (the nose, larynx).

Ordinarily the poisonous substance attacks not any single organ of man, but several organs, and if one speaks of OVs -- for example, of a blistering action -- then the predominant action of the given OV under the conditions of combat is understood.

II. Smoke-forming substances (DVs /dymoobrazuyushchiye veshchestva/) create in the air smoke screens of nontoxic, or in any case, slightly toxic smoke. They are used for masking actions so that such cannot be observed by the enemy, and for hindering the aimed fire and bombing, of the enemy. The smoke release is conducted with the aid of smoke bombs (which are dropped from the windward side of the target), or of smoke pots (tin cans filled with a mixture of smoke-forming and inflammable substances), or of special aircraft smoke generators (DAP /dymovyye aviatsionnyye pribory/), mounted on airplanes. Smoke-forming substances include: white phosphorus which inflames spontaneously in the air (with the formation of a dense cloud of white smoke), chlorosulfonic acid, stannic chloride, and diverse solid smoke mixtures. In the presence of the burst of a phosphorous bomb or shell, particles of phosphorus are sprayed in all directions which cause painful, slowly healing burns on the skin.

III. Incendiary substances have the purpose of evoking fires (of buildings, forests, grain crops, et al.), incidentally defeating the human forces involved. For this purpose, phosphorus is applicable, but thermite and elektron /the incendiary, a magnesium-base alloy/ which develop a temperature -- when burned -- of up to 3,000° are more suitable. Thermite represents a powdery mixture /of powdered aluminum/ with ferric oxide. It burns with a blindingly bright, slightly-smoking, yellow flame even without access to air, for the oxygen necessary for burning is contained in the ferric oxide. Elektron is a special alloy of magnesium with aluminum and other metals. Its burning (in access to air) is accompanied by a bright light-blue flame and the evolution of heavy white smoke.

Foci of fire are created with the aid of incendiary aerial bombs, equipped with thermite, phosphorus, elektron, as well as with inflammable liquids.

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Methods of Application of BOVs

1. Cloud gas /gas cylinder/ attack. This was used for the first time by the Germans in 1915, consisted of releasing gas in the direction of the enemy from steel vessels (gas cylinders). The cylinders were filled with liquefied gas (chlorine, phosgene) under raised pressure. When the stopcock was opened, the liquefied gas was sprayed out through a hose, and, rapidly being vaporized, was directed in a compact cloud. This cloud floated along the ground and, with a favorable wind, sometimes moved 10-12 km in the direction of the enemy. To form a mighty gas cloud, the gas release was conducted simultaneously from hundreds and thousands of cylinders, which were set up over an area of several kilometers. In view of the cumbersomeness, dependence on the direction and speed of the wind, and other difficulties, this method was discarded.

2. The mortar method. This consisted in shelling the enemy with mines charged with OV from special mortars. When the mine falls, it bursts, and the OV is dispersed.

3. Chemical artillery shells. These are distinguished from ordinary shells only by the fact that they contain OV. They are charged both with

stable and also unstable OVs, as well as with smoke-forming incendiary substances. In addition to purely chemical shells, chemical fragmentation shells are still used to attack enemy personnel both with OVs and with fragments (Figure 243). Firing with chemical shells, besides attacking enemy personnel, can have the object of contaminating the locality with stable OVs which are sprayed in the form of drops when the shell bursts, thereby hampering the advance of the enemy, the operative transport and supply of enemy troops ("contamination firing"). Finally, its object can be the exhaustion of the enemy, which is compelled to wear gas masks for a long time ("exhaustion firing").

4. Chemical aerial bombs. Illustrated in Figure 244, these are charged with various poisonous substances used in combat (BOVs). They can either be of percussive action or be time bombs. In the case of the latter, they burst in the air, falling short of the ground, to cover a large area with droplets. Chemical fragmentation bombs are the same as fragmentation bombs, but with an OV of a lachrymatory or irritant action. Such bombs attack both with fragments, and with OVs.

5. Apparatus for spraying liquid OVs from an airplane. VAPS [vylivnyye aviatsionnyye pribory — aerial spraying apparatus] consist of metallic reservoirs (up to several hundred lit OV in capacity) which are carried under the wing or fuselage of the plane. At the required moment the liquid OV (ordinarily mustard gas [yperite], but in winter it may also be diphosgene) is released externally and is divided (by a strong wind or by the jets of air coming from the propeller) into very fine droplets, which fall to the ground in the form of a rain.

6. The contamination of the locality. Such contamination is sometimes conducted by the dispersion of liquid OV from apparatus which is:

(a) portable, e.g., carried on the back in some type of knapsack, with a long hose having at its end a spraying device, or from (b) transportable apparatus (e.g., specially adapted tank trucks).

7. Smoke pots. These are used to produce a cloud of poisonous smoke (ordinarily OV of irritant action). These are tin cans, filled with a mixture of smoke-forming and inflammable substances. (The same kind of pots, as has already been stated, are also used for the formation of smoke screens by means of the slightly poisonous, smoke-forming substances described above.)

CHEMICAL-WARFARE DEFENSE

Article 483

Agents of chemical-warfare defense are divided into (1) agents of personel (individual) protection against OVs affecting human beings and animals, e.g., gas masks and agents of epidermal protection; (2) agents of group or collective protection, e.g., shelters and covered positions; (3) agents of decontamination for the removal or decontamination of the OV which may have covered the soil, products, various objects, etc; (4) agents of detection (indication) of OVs.

MEANS OF INDIVIDUAL PROTECTION

The means of personel protection include: (a) gas masks for the protection of the respiratory tracts, the eyes, and the facial epidermis,

and (b) means for the protection of the skin of other parts of the body (protective clothing including rubber boots and gloves, protective capes, stockings, underwear, and other apparel impregnated with a special composition).

Article 484. Gas Masks

Gas masks are of 2 kinds: filtering and isolating. The action of filtering gas masks is based on the principle whereby the poisonous external air, when inhalted, passes through the absorbing canister of the gas mask, thus reaching the respiratory organs free of OV, the OV having already been filtered out. In this case, respiration proceeds at the expense of atmospheric air.

Isolating gas masks prevent poisonous air from reaching the respiratory organs, i.e., the latter are "isolated" from OVs. These gas masks supply the respiratory organs with oxygen from a supply of oxygen contained in the mask itself.

The basic models of filtering gas masks are represented by the BN /boyevoy nesekretnyy -- nonrestricted combat/ types of diverse design.

The BN gas mask with helmet and a T-5 canister (Figure 245) consists of a gas-mask canister and a headpiece with an exhalation valve.

The gas-mask tin canister has perpendicular projections (ridges on canister of gas mask) for strength. It contains so-called activated charcoal for absorbing gaseous (vaporous) OVs. At the bottom of the canister there is a round aperture in which is placed a tin stopper with grooves; placed on the stopper is a rubber disk serving as an inhalation valve. In the presence of inhalation, the rubber disk is raised slightly, thereby making access in the canister for the inhaled air; in the presence of exhalation, the disk, tightly pressed to the grooves, closes the openings and prevents the reverse entrance of air being exhaled through the canister. Packing nets and compressing springs provide for the protection of the contents of the canister from wear, pulverization, and displacement.

On the cover of the canister there is an elbow nozzle to which is screwed a rubber tube (covered with knitted fabric) which joins to the gas mask. It is corrugated (accordionlike) in order that air may still reach the headpiece in case the tube is over extended. Its upper edge is attached to a metallic connecting T-joint with 3 branch pieces: fastened to one branch piece is the helmet of the gas mask; to another, the corrugated tube; and to the third, the exhalation valve in a metallic protecting frame. The exhalation valve consists of a flat little rubber bag with 2 openings through which the exhaled air passes (in the presence of inhalation, the walls of the little bag are pressed toward each other, not permitting the external air to pass under the helmet). The valve is fitted into a metallic protective frame.

The rubber helmet, which is placed on the head, is supplied with goggles (made of transparent glass in metallic frames) and a branch piece in the form of a finger for cleaning goggles which have become clouded. The helmets are produced in 4 sizes (size No 1 is the smallest).

Indicated by arrows in Figure 245 is the route of the air current through the gas mask with helmet and T-5 canister. By inhalation, air contaminated with OVs finds its way through the inhalation valve into the gas-mask canister where it is freed of contamination. Rendered thusly harmless, the air passes through the corrugated tube under the

Article 486

Adjustment of the Gas Mask

In obtaining a gas mask, it is important that a helmet (or mask) be selected in accordance with the dimensions of the head. A helmet that is too small will compress the head and neck; thus, one cannot remain within the gas mask comfortably for a long period of time. On the other hand, an excessively large mask (or helmet) will permit OVs to enter the respiratory tract. To facilitate the adjustment of the gas mask, 2 measurements of the head are made with a centimeter tape (Figure 249): (1) along a line proceeding along the edge of the chin, the cheeks, and over the highest point of the head, and (2) along a line passing under the brows and joining the openings of the ears. The 2 figures thus obtained are then added. If the sum is not more than 95 cm, a helmet of size No 1 should be chosen. Size No 2 is chosen when the sum is from 95.5 to 99 cm; size No 3 is chosen if the sum is from 99.5 to 103.5 cm; size No 4 is chosen if the sum is more than 103.5 cm. In case only 3 sizes of masks are available, size No 1 is chosen when the sum is not more than 95 cm; size No 2 when the sum is from 99.5 to 103.5 cm; size No 3 when the sum exceeds 103.5 cm. Once having selected a gas mask of suitable size, the mask should be well adjusted to the face and head by means of the tape buckles.

Assembling the BN Gas Mask

In the case of a new gas mask, the following is necessary preliminarily: (1) take out from the bottom of the canister the cardboard disk protecting the contents of the box from deterioration when the gas mask is kept in the warehouse; (2) take the tin cover off the elbow nozzle of the box, screw the corrugated hose on the elbow nozzle with the aid of a coupling nut. The coupling nut is screwed on as far as it will go, and the canister of the gas mask with its longitudinal seam and mask (or helmet) with goggles should be turned in one direction. After this, the helmet or mask with the corrugated tube is placed in the smaller compartment of the carrier, and the canister, with its longitudinal seam to the right, is placed in the larger compartment.

Upkeep and Storing of the Gas Mask

It is necessary to protect it against blows, jolts, and strong concussions; to bring it no closer than 1 to 1.5 m to a stove (prolonged heating spoils the rubber). The rubber is also spoiled by low temperature and dampness, as is also the chemical absorber. In a moist room the metallic part rusts, while the corrugated tube becomes covered with mold. The lower opening of the canister must be kept closed off when the mask is stored; after use of the gas mask (even for instructional purposes) one should wipe inside the mask or helmet and the valved canister. The gas mask should be kept in a bag, suspended on a strap by a nail or hook, or in a cupboard in a vertical position with the bottom down. If the gas mask has been exposed to rain, it should be taken out at the first opportunity from the carrier, wiped, and dried thoroughly. Extraneous objects must not be placed in the carrier; one should particularly guard against clogging up the exhalation valve. In winter the moisture accumulating in the exhalation valve can, in the presence of freezing, form an ice crust. To prevent this it is recommended that from time to time one warm with the hand the protective small cup of the exhalation valve, for in a gas mask with a helmet the protective frame is covered with a little cloth bag and several drops of glycerine are introduced within the valve. Brought from the cold into a warm room, a gas mask will cloud; consequently it is necessary to take it out from the carrier, let

the metallic parts become damp for about a half-hour, and then rubb off the moisture and place the mask back in the carrier.

In checking the serviceability of a gas mask (including one newly obtained) it is subjected to inspection. Damaged places or places presumed punctured (in the rubber) are encircled by means of a chemical-ink pencil for subsequent repairing. In checking the serviceability of the helmet (mask) and exhalation valve, the gas mask is first put on. Then, when one is convinced he has a correctly-fitting mask (helmet), one exhales, the corrugated tube is tightly compressed with the fingers at the connecting tube, and one attempts a deep inhalation. If this proves impossible, i.e., if the air does not pass under the mask or helmet, this means that the mask (helmet) and the exhalation valve are serviceable. In checking the corrugated tube, the following procedure is followed: having put on the mask (helmet), one exhales, grasps firmly the tube at the bottom near the elbow nozzle of the canister, then attempts to inhale. If the serviceability of the mask (helmet) and the exhalation valve are preliminarily checked, and the proper rectifying measures taken, a serviceable corrugated tube will not allow air to enter under the mask (helmet).

To check the serviceability of the gas mask and the correctness of fitting, it is recommended that one use (with the participation of an instructor of the Osoaviakhim /Obshchestvo sodeystviya oborone i aviatsionnomu i khimicheskomu stroitel'stvu SSSR -- Society for the Promotion of Defense and Aviation and Chemical Industries/) a portable gas chamber. This device is bell-shaped, closed at the top, and constructed of gas-impenetrable material. It is suspended on a rope by means of a pulley to a support. The device is let down over the subject (of course wearing a gas mask) to the subject's middle; the training (lachrymatory) OV will produce irritation of the eyes if the gas mask is nonserviceable.

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Use of the Gas Mask

Obligatorily, it is worn over the clothing, but in various positions depending on the situation. When the danger of chemical assault is not immediately threatening, the gas mask is carried in the march position, i.e., the carrier is carried on the left side, the strap being over the right shoulder, the flap of the carrier buttoned up and turned outward. (For prevention of the clouding of the goggles, the latter should be treated with a pencil as described above.) Upon an air raid warning the gas mask is transferred to the "on the alert" position. For this (if it is not raining, or if the subject is within doors), one should unfasten the flap on the carrier, take out the cord, and, encircling the latter around the body, fasten the carrier in such a way that the gas mask does not hang loosely on the side as the subject walks. (It is still easier to fasten the carrier if, in place of the cord, the gas mask is supplied with a tape having an adjustable buckle and a little snap hook.) Besides this, the headgear is arranged so that it can be rapidly taken off (the laces of the ear muffs on the winter cap, for example, are untied), and the goggles are treated with the afore-mentioned pencil, if this has not already been done. In the battle position the gas mask is put on from the "on the alert" position upon the signal "gas alert" or "gases," or independently in the presence of the detection of OVs. For this position, holding one's breath and narrowing one's eyes (in view of the possibility of lachrymatory OVs), the mask (or helmet) is grasped at the thick outer edge at the chin portion with the thumbs and with the other fingers inside the mask (helmet). Then the mask (helmet) is quickly removed from the carrier. The mask (helmet) is brought to the face, placed over the chin,

and pulled up over the head, by moving the fingers upwards along the lower tapes of the mask or along the edges of the helmet. When the fingers reach the headgear it is raised a little only at the anterior portion (for example, at the visor) with the thumb and the index finger, while the other fingers continue pulling the mask (helmet) further on the head. Thereupon the headgear is put on. One should exhale strongly (in a gas mask with a helmet one should first compress the corrugated tube with the hand at the connecting tube) and, having opened the eyes, renew respiration. (The exhalation has the purpose of removing from within the mask the poisonous air which may have entered at the time of putting on the gas mask.) It is not permissible to put on the mask (helmet) over a kerchief, neckerchief, etc.: they should be preliminarily removed.

Removal of the gas mask (upon the command "take off the gas mask") is done in the following fashion. With the left hand the distribution-valve canister (in the case of the helmet, the connecting T-piece) is grasped in such a way that the thumb and index finger also clasp the elbow nozzle (i.e., the lower portion) of the mask or helmet. Having thereupon lifted the headgear a little with the right hand, the valve chamber (or the connecting tube) is drawn off with the left hand. Then, by a movement of this same left hand forward and upward, the mask (helmet) is removed -- first from the chin, then from the face and head. After this, the headgear is put on, and the mask (helmet), having been unscrewed, is turned inside out, carefully rubbed dry, and left in this form for final thorough drying (in winter it may be placed on one's chest inside one's overcoat).

Stowing the Thoroughly Dried Mask in the Gas-Mask Carrier

Having taken the mask with the right hand by the goggles and having placed it on the left palm, the mask is first folded lengthwise, covering up with the rubber mask the right glass, and then transversely in such a way that the piece on the top of the head covers up the left glass, and, finally, is folded once more at the valve chamber on itself (or, as they say, in the direction of the margin). After this the corrugated tube is taken with the left hand by the middle and is stowed in the small compartment of the gas-mask carrier at the bottom. With the right hand, compressing the folded-up mask with the fingers toward the valve chamber, the mask is placed upwards in that same compartment of the carrier, the exhalation valve to the left, the chin portion to the top.

The helmet is stowed by the same methods, but without putting it on the palm.

The described methods of stowing make it possible, when putting on a gas mask, to take the chin portion with the fingers of both hands, as was indicated above.

Training

It is necessary via prolonged training to acquire habituation to correct respiration (slow and profound) in a gas mask, to putting it on rapidly (no longer than 5 seconds), and taking it off rapidly. Sometimes one has to use an unserviceable gas mask or to rapidly replace it with a serviceable one. The ability to do this, and also the accomplishment of work for the course of 5 to 6 hours within a gas mask is achieved via training.

Article 488

Rules for Using an Unserviceable BN Gas Mask in Poison Air (If a Serviceable One Is Not at Hand)

When there is a small tear in the mask (helmet), the torn place is squeezed between the fingers or it is pressed to the head (Figure 250, I). In the presence of a major injury of the helmet (mask), deterioration of the exhalation valve or the corrugated tube (when the gas mask canister is serviceable) one acts as follows. Having held one's breath, one takes the canister out of the carrier, unscrews it from the corrugated tube, and, having narrowed the eyes, drops the mask (helmet). After this, having taken in the mouth the elbow nozzle of the gas-mask canister (the latter is held in the right hand), one compresses the nose with the left hand and breathes calmly with the mouth through the canister (Figure 250, II). In a T-5 canister it is necessary first of all to lift the inhalation valve a little with the finger from the bottom and to hold it in this position (or to slip a small stick under the valve) in order to provide an exit from the canister for the air which is being exhaled. If the canister of the gas mask is pierced, then, having held one's breath, one covers the opening with the palm (Figure 250, III), having placed under it a handkerchief folded in several layers, or one smears the injured place with the soft part of bread, clay, etc.

Changing the Gas Mask

If a serviceable gas mask is available to replace the unserviceable gas mask in a poisoned atmosphere, one resorts to the following method. Upon detection of unserviceability one immediately holds the breath and takes from the carrier the mask (helmet) of the serviceable gas mask; having taken off the headgear (with eyes narrowed), one takes off the mask (helmet) of the unserviceable gas mask and, having squeezed the exhalation valve, one makes a deep exhalation to remove the poisoned air from inside the mask (helmet); all that remains to be done is to take from the carrier the canister of the unserviceable gas mask, to put in its place the canister of the serviceable gas mask, open the yes, and resume respiration.

Putting a Gas Mask on a Casualty

In the case of a casualty found in a poisoned atmosphere and unable independently to put on a gas mask, the person rendering the aid takes the mask (helmet) out of the carrier and puts it on the chest of the casualty and places the gas mask canister between his legs. Having lifted a little the head of the patient and having placed it on his own knee, the person rendering the aid takes the headgear off the casualty, places the mask (helmet) in a position for putting it on (as has been described above), and, having moved its lower part up to the chin, pulls it on the head. After this we fasten the carrier of the gas mask on the body of the person who has been suffering and put on the headgear.

Disinfection of the gas mask. If a gas mask, which has been used by one individual (particularly a person who has been sick), is given to another, then it is obligatory to subject it to disinfection. For this the mask (helmet) of the gas mask is rubbed several times on the outside and on the inside with a 2% solution of formalin or denatured alcohol and then is aired. The canister of the gas mask is rubbed on the outside with an aqueous solution of mercuric chloride (1:2,000): the gas mask carrier is disinfected in the ordinary manner except for the disinfection of fabric (see section on "Disinfection" above).

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The GP-1 Civilian Gas Mask

(See Figures 251-254.) This consists of a round metallic canister and a facial part (mask) attached to the head by tapes (2 frontal, 2 temporal, and 2 occipital), which are supplied with movable buckles. In each of the tapes is sewn a piece of rubber ribbon which ensures better tension of the tape on the head: it is sufficient to draw the free ends of the side tapes and the mask will fit tightly on the face. This is also promoted by the obturator, i.e., a strip of rubberized fabric, sewn by one of its edges to the internal side of the mask along its entire circumference.

The upper half of the canister of the gas mask is filled with activated charcoal; in the lower half there is a paper filter for absorbing the poisonous vapors. The bottom of the canister is made of metallic netting; on the cover of the canister the mask is attached to the elbow nozzle; in the left portion of the mask we find a valve chamber with an exhalation valve (its construction brings to mind the exhalation [sic] valve of the T-4 canister; see above).

Within the mask an inhalation valve of ordinary construction is attached on the elbow nozzle.

In the "on the alert" position (Figure 243), the gas mask is carried on the chest on a special tape sewn to the mask; for carrying in the marching position, the gas mask is placed in a carrier of elongated form, upright and without putting the facial part away.

In the absence of a gas mask one has to use simplified masks -- the UMP-4 [Uproshchennaya Maska Protivogaza] gas masks, which can be prepared, in accordance with a special set of instructions, from wadding-gauze pads, impregnated with chemical substances containing activated charcoal. The period of action of the UMP-4 (20-30 minutes) is sufficient to leave the contaminated area.

MEANS OF PROTECTING THE SKIN

Article 490

Ordinary clothing does not ensure sufficient protection against OVs of a dermal-blistering action (mustard gas, etc). Consequently, fighters are also supplied, besides the gas mask, with a protective cape, protective stockings, and special gloves. The cape for protection against drops of stable OVs, sprayed from an airplane, is prepared from special fabric or paper, impregnated with a protective composition. It is similar to a sleeveless-jacket raincoat with a hood; from the internal side of the lappet of the cape it is supplied with straps or with little pockets, in order to more conveniently draw one lappet on the other. Initially the gas mask is put on, and then, slightly bowing forward, the cape is thrown on oneself over the head behind the back over the right shoulder. Upon termination of the chemical attack the cape is at once taken off and in such a way that its contaminated side may not touch against people standing nearby. If it is necessary to pass through an area contamined with OVs, protective stockings are used which are put on over the ordinary footwear and are attached to the legs with tapes.

For protection against the vapors of stable OVs, clothing and underwear are also used which are impregnated (saturated) with a special

composition of such a property that the fabric does not allow to pass the vapors of stable PS, remaining, however, permeable for air.

Several special commands (chemists and others) are supplied with a special protective costume -- coveralls (Figure 255). They are so termed because they represent a combination, i.e., a combination of a jacket and trousers from one piece of fabric, subjected to treatment with a special protective composition which does not pass OVs. Such a style of costume, the presence of a hood (the gas mask being put on over it), lapels with tapes, double cuffs, and laces does not give to the external air access to the body and thereby protects not only against drops of stable OVs, but also against their vapors. The coveralls are put on (Figure 255, I) through a longitudinal cut (going from the collar to the trousers), under which is sewn a chest flat which covers the chest and neck. For covering the neck in front there serves yet another throat flap, sewn to the collar of the coveralls. The lower part of the costume is terminated by stockings over which, after one has preliminarily taken off the footwear, rubber boots are put on. The flaps of the trousers are tied over the boots; the arms are protected by thick rubber gloves, the edges of which are also covered with a cuff (Figure 255, II). In summer the coveralls are put on over the underwear; in winter, over the topcoat. The coveralls should be taken off carefully, in order that OVs do not get from them on the clothing. It is best in taking off the protective clothing to resort to the aid of a comrade with protective gloves.

The considerable weight of the coveralls, the slight elasticity of the fabric, and chiefly, the absence of a flow of fresh air under the protective costume, hamper prolonged presence or work in them, particularly in the hot summer weather. In the presence of temperature below 15° one can work in a coveralls for the course of 3 to 4 hours and even more, depending on the training. In the presence of temperature of 25-30°, presence in the coveralls for longer than half an hour threatens overheating of the organism (on heat stroke, see Article 469).

MEANS OF COLLECTIVE (GROUP) PROTECTION

Article 491

Shelters are special rooms intended for the cover of young children, and also of adults incapable, due to disease, of using the gas mask, or who happen to be without it in the moment of chemical attack. In shelters not protected against OVs, people of course must have a gas mask handy. Shelters, designed first of all for the protection of people against OVs and only to a certain extent against fragments of aerial bombs and shock waves, are called protective rooms. By slit trenches are meant narrow and deep ditches which represent the simplest cover from bullets, fragments, and shock waves (they are arranged in the absence of basement cover and also on open areas of a city, in squares, gardens, parks, etc).

Antichemical shelters (gas shelters) are either hermetic (without a supply of air from the outside) or ventilatable.

A. One can equip a dugout, basement, cellar, and in general any room which permits hermetization, i.e., barrier against the entrance of external air, in imitation of a simple (without ventilation) gas shelter. People in such shelters use only that air which is included in the given room, and consequently it is forbidden to smoke or heat a stove in them. Illumination with a kerosene lamp, other lamps, or candles, which diminish the supply or pure air, is limited to the lowest possible level. Since

no less than 2 m^3 of pure air are required for the respiration of a healthy human being for one hour, and no less than 3 m^3 for a patient, it is easy to calculate that a shelter 60 m^3 in volume can accommodate for one hour 30 healthy human beings or 20 sick human beings, or 15 healthy human beings for 2 hours, etc.

Article 492

Hermetization is achieved by the closing of all openings (also ventilation openings) and chinks (in the windows, doors, ceiling, and floor) by adjusting the windows and doors to the frames and skirtings. Chinks are rubbed over with putty, glued up with paper in 2 to 3 layers, laid up with bricks on a cement solution, and poured over with this solution, walled up with wooden laths, painted on the outside with oil paint. Loose places between the walls and the frames of the windows and doors are stopped up with oakum, and then plastered, painted, glued with paper, etc. Superfluous windows and doors can be walled up tightly on the outside and on the inside with plywood; the intervals between them are filled up with earth.

B. In ventilatable shelters there is a ventilator, set in motion by an electric motor or by hand. It sucks air from the outside (according to the direction of the dotted-line arrows in Figure 256), cleans it free from OVs in a special filter-absorber (of the type of an enlarged gas mask canister) and feeds it into the room of the shelter.

Since the air is continuously driven into the room, while its outflow from it is hampered when the shelter is sufficiently hermetized, there is created in the shelter a certain excess pressure of the air (air head). The air will displace itself from the place with the higher pressure in the direction of lesser pressure, i.e., from the shelter externally through chinks and places which are not tight (Figure 256, 1, 2, 3, 4, 5, 6), and thereby will interfere with the entrance of OVs through these same chinks inside the room. In the absence of chemical danger the shelter serves only for cover against bombs, artillery shells, and shock waves; in this case pure air is sucked up with a tube (Figure 256, ChV along the direction of the continuous arrows) and, bypassing the filter, gets along the tube into the room. In case the filter-ventilation installation described ceases to work, it is desirable to equip the shelter supplementarily with apparatus: (a) for absorbing excess carbon dioxide being evolved in the presence of respiration with alkali, and, (b) devices making up for the insufficiency of oxygen via its release from special cylinders or via another route (regenerative installation).

It is necessary to construct the entrance to the gas shelter of any type in such a way that poison air cannot penetrate through it within the shelter. For this the shelter is equipped with a spacious vestibule air lock (entrance-hall) with 2 doors: the internal door, opening into the shelter, should not be opened before the external door which is openable externally is closed. In large gas shelters there are 2 vestibular rooms: in the first is set up a cupboard and drawers for contaminated clothing and underwear; sanitary treatment of people (washing under a shower, etc) is conducted in the second vestibule.

PROTECTION OF FOOD PRODUCTS, WATER, AND MATERIAL PARTICLES /PARTS/ AGAINST OVs

It is much easier to protect products, water, and other objects against contamination than to decontaminate poisonous substances which have gotten on them.

Article 493

Protection of food products against unstable OVs in the gaseous state and against poisonous fumes is achieved by wrapping them up in dense fabric or paper. Their protection against liquid stable OVs with the aid of packing in a package impenetrable to OVs (glass, metallic, or wooden, well put together and painted) and covering with special protective fabrics when being transported is more important. It is important to remember that mustard gas in any state dissolves in oils, fats, milk, and renders them unsuitable for use. A canvas bag protects them rather well on condition that between it and the products there is placed a layer of straw or hay 5-10 cm in thickness and the same layer outside the canvas.

For the protection of water against OVs it is kept in well-covered receptacles, which are again covered above with canvas: arranged over wells are sheds with a tight cover. In order that the OVs may not get into the well through the soil, clay is filled up around the frame in the form of a ring one m in width and 0.5 m in depth, and the clay is rammed. If mustard gas (or lewisite) in a liquid state enters the water which is being kept in barrels, cisterns, etc, then the water can no longer be used. Water of large and rapidly flowing rivers is freed from OVs rather rapidly by the natural route, while nonflowing reservoirs are contaminated for a long time.

Medical equipment in so-called uniform boxes (wooden, well fitted together, and painted with an oil paint) are sufficiently protected against OVs. It is useful, however, preliminarily to smear surgical instruments with vaseline in order to protect the metallic parts against rusting in case of the influence on them of chlorine or of phosgene. For the protection of other objects, fabrics impenetrable to OVs and canvas are used, as was described above for food products. The dressing material is protected for a short time against the vapors of mustard gas by being wrapped in cellophane or waxed paper.

DECONTAMINATION

Article 494

The rendering harmless of objects contaminated with OVs is called decontamination. Decontamination from mustard gas and lewisite has maximal significance, for these stable OVs readily contaminate the soil, clothing, objects of equipment, and other objects which can long retain OVs and thus because a source of subsequent poisoning of human beings and animals. The selection of the method of decontamination depends on the thing which it is necessary to decontaminate and under what conditions it is to be decontaminated. For example, for the decontamination of streets contaminated with mustard gas, they are strewn with chloride of lime in the dry form (see the division "Disinfection"); for the decontamination of walls and the surfaces of wooden objects they are coated with a chloride of lime slurry /see Note/.

(/Note/ The slurry is prepared by mixing powdered chloride of lime in water to a density of a liquid paste at a ratio of 1-1/2 parts (by volume of dry chloride of lime per one part of water. In summer the chloride of lime violently reacts with mustard gas; the slurry more weakly. In winter, particularly in freezing weather, the reaction proceeds slowly and weakly. In moist air the chloride of lime quickly becomes damp, being coverted into lumps and becoming unsuitable for decontamination. It is necessary to keep it in wooden barrels. For the

decontamination of clothing, footwear, and metallic objects, chloride of lime is unsuitable, for it spoils the fabric and the leather and corrodes the metal. In the presence of work with chloride of lime one must not touch it with unprotected hands, since the human skin coarsens and fissures appear on it.)

Chloride of lime (also chloramine, dichloramine) evolves chlorine which, entering into chemical union with stable OVs, as it were neutralizes them; consequently such means of decontamination are called neutralizers. One can remove OVs from metallic or glass objects, and also from the hands with the aid of solvents. Kerosene, gasoline, turpentine, carbon tetrachloride, and others dissolve SOVs. However, in contrast to the neutralizers, the solvents do not decompose OVs; consequently, rags used to dissolve OVs should be burned or buried in the earth, with chloride of lime strewn above. Used solvents containing OVs can become a source of contamination, and they are consequently subject to destruction (combustion). Decontamination by boiling is based on the fact that a part of the OVs are decomposed by hot water into harmless or less harmful products; the others are eliminated with the water vapors. In the presence of decontamination by flame or by vapor the OVs are partially volatilized, partially burned, or decomposed; also used are decontamination by hot air or vapor (in decontamination chambers) or airing until the disappearance of an odor. In the presence of contamination of flour, grain, it is necessary to remove the superficial layer (to the depth of penetration of the OV) and destroy it.

Article 495. Decontamination of Objects Infected with Stable OV (Of a Blistering Action)

A. Decontamination from Mustard Gas (or Lewisite) in the Liquid Form

Decontamination of the soil has most important significance, for in the cold time of the year little puddles of mustard gas can serve for weeks as a source of infection. In the summer this period, particularly for places covered with cement or with cobblestones, is reduced to several hours. In the presence of decontamination with chloride of lime, the latter is strewn with the aid of shovels, sieves, cartable decontamination devices (Figure 257), automotive decontamination devices, etc. In a square meter of area about one half kg of chloride of lime is consumed. The decontamination is considered completed a half hour after the scattering of the chloride of lime.

In places covered with grass or with weeds, decontamination by burning off the OV via spraying the locality with hot liquid (for example, a mixture of petroleum, kerosene, and gasoline) is more convenient. Ten minutes after the decontamination by fire it is already permissible to pass through the decontaminated locality. Sometimes the contaminated soil is simply taken up with shovels or with special machines to a depth of around 5 cm (snow to 15 cm) and is thrown out to the side. One can go without danger in a gas mask along the passage which is being formed. One can also arrange timbered or board planking above the contaminated area or scatter it with sand or with brushwood (in a layer of 15 cm).

Decontamination of Buildings and Objects of Everyday Use

The external sides of buildings are smeared with the aid of a brush with chloride of lime slurry which is left until it dries and falls off. The slurry is washed off from the roof with water. In the presence of the contamination of the internal walls, they are initially smeared with the slurry, and then the stripped-off wallpaper (or the scraping from

wooden walls are burned, and the slurry is a second time placed on the wall which is washed off after 2 days, after which the room is aired. Articles of furniture with traces of liquid OVs are taken out from the rooms as far as possible (for 100 m) and are treated by various methods. It is necessary to scrape the contaminated layer of wood from wooden articles (tables, beds, etc) and then to cover them with a layer of chloride of lime slurry for several hours. Then after washing off with hot water they are left for airing for 2-3 days and in conclusion are subjected to painting with varnish or with an oil paint. The paint is scraped off from painted articles and after a twofold treatment with slurry they are again painted.

Metallic things contaminated with liquid OVs are washed in kerosene or gasoline or repeatedly rubbed with a rag moistened in solvents, each time changing the rag used. For sprinkling the contaminated metallic parts with solvents a knapsack-type decontamination device is also used. In it the liquid solvent (with the aid of a contrivance which is set in action by the oscillation of a lever) is sprayed out through a rubber hose and a fire pump with a nozzle. The apparatus is carried on the back in the form of a pack. Glass and porcelain are decontaminated by boiling in water or by repeated rubbing with chloride of lime slurry with subsequent washing off with hot water. Objects which have become worthless or little valuable objects are burned (but with precautions, for the fumes contain OV; those conducting the decontamination should be located in a windward direction).

Decontamination of Clothing

Cotton, linen, and other fabrics are subjected to boiling for the course of one to 2 hours in hot 1% solution of soda (steeping containers are desirable) with subsequent laundering. Clothes which do not withstand boiling are decontaminated in chambers by a stream of hot air: woolen fabrics at a temperature of 90°C for a course of 2 hours; fur and leather for a course of 8 hours at a temperature of 60°C; coveralls for 6 hours at a temperature of 75°C. Rubber boots and gloves are subjected to boiling for the course of 2-1/2 hours. After the treatment the clothes are subjected to thorough airing for the course of several hours.

Article 496

Decontamination of Medical-Sanitary Equipment

Bandage material contaminated with liquid SOVs is decontaminated by boiling for 1-1/2 hours with subsequent laundering, after which it can be used only for compresses and bandages, but without application to the wounded surface. Wadding, and also medications, contaminated with liquid SOVs, are destroyed. The method of decontamination of the stock of glass, porcelain, metal, is selected depending on the material, as has been said above. We shall note the peculiarities of decontamination of sanitary stretchers. If the cloth support panel is taken off, then it is decontaminated by boiling for the course of an hour with subsequent rinsing out in water (nonremovable panels are subjected to treatment with a jet of hot water from a sprinkling pump for the course of 20 minutes alternately from one and the other side. The frame of the stretcher is decontaminated by thoroughly rubbing for 10 minutes with hot water with soap, using a stiff brush. It is also desirable supplementarily to subject the handles of the stretcher to a boiling of an hour duration, lowering them into the pail with boiling water alternately at different ends.

B. Decontamination of Objects Contaminated with the Vapors of Stable OVs

This is conducted by airing until complete disappearance of the odor of the OV. Sometimes it may be necessary to supplementarily thoroughly wash the things in hot water with or without the addition of 1% soda, or to thoroughly rub with solvent or to decontaminate soft things with a stream of hot air in special chambers.

Decontamination of Objects Contaminated with Unstable OVs

Unstable OVs (chlorine, phosgene), has has been stated, are quickly vaporized, but in places of "stagnation" of vapors (in narrow courts, boulevards, cellar rooms, in aerial bomb craters, in trenches, etc) one has to resort to measures of decontamination. The fundamental method is airing which is accelerated by heating a stove, by the arrangement of a current of air, by raising bonfires, by shaking out blankets and sheets from windows, etc. Soft things should as much as possible be put out in the air, shaken out, and beaten out. Fabrics which are not spoiled by boiling are boiled a half hour in a 1% solution of soda; solid objects and also floors are washed off with hot water with the addition of 1 to 2% soda. The water is decontaminated by boiling. For neutralization of phosgene and the vapors of diphosgene in the air of rooms one sometimes uses dispersion (with the aid of a sprinkler pump or of pulverizers) of various alkaline solutions, for example, of hyposulfite, soda, sodium hydroxide, etc.

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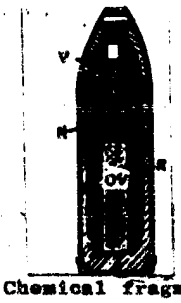

Figure 243. Chemical fragmentation shell (in section). OV, poisonous substance; R, explosive charge of the explosive substance; V, fuse; K, body of shell.

Figure 244. Chemical aerial bomb. K, body of the bomb; OV, poisonous substance; S, stabilizer; V, fuse and charge of explosive substance.

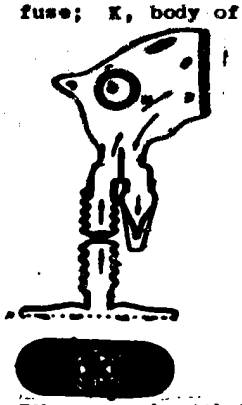

Figure 245. BN gas mask with helmet and G-5 canister.

Figure 246. Carrier for gas mask.

Figure 247. BN gas mask with mask and T-4 canister. TS, connecting tube; KK, valve chamber; P, connecting tube; VY, exhalation valve in a little protective cup; M, mask; L, frontal tape; V, temporal tape; NA, piece on the occipital region of the head; N, lower tapes.

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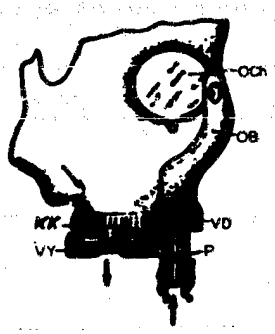

Figure 248. Section of a MOD O-8 mask. OB, rubber cowling; OCh, mounted goggles; KK, valve chamber; P, connecting tube; VD, inhalation valve in little protective cup; W, exhalation valve.

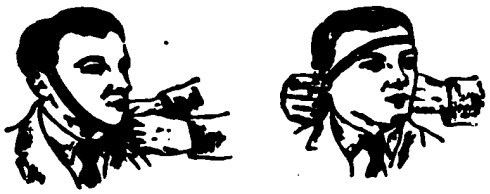

Figure 249. The 2 measurements of the head in selection of helmet or mask.

Figure 250. Use of an unserviceable gas mask (explanation in text).

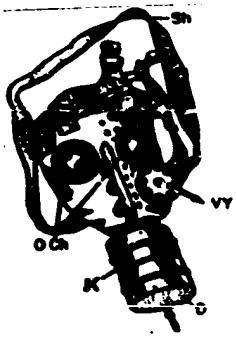

Figure 251. GP-1 civilian gas mask (view from outside). K, canister; D, mesh bottom of the canister; OCh, goggles; VY, exhalation valve; Sh, neck tape.

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Figure 252. GP-1 civilian gas mask (view from inside). OCh, goggles; OB, obturator; Sh, neck tape; VD, inhalation valve (the left edge of the rubber leaf is rolled up); VY, exhalation valve.

Figure 253. GP-1 gas mask in the on-the-alert position.

Figure 254. GP-1 gas mask in the battle position.

Figure 255. Set of protective clothing (coveralls, rubber gloves, rubber boots, under which are protective stockings sewn to the trousers).

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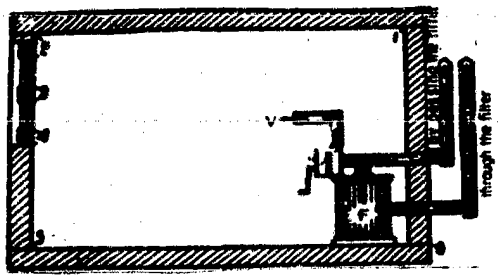

Figure 256. Shelter being ventilated (explanation in text).

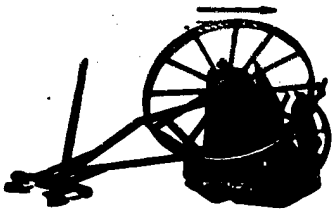

Figure 257. Cartable decontamination apparatus.

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